

**PROPERTY FIRE LOSS ESTIMATIONS
DEVELOPMENT OF STANDARD GUIDE FOR
THE TULSA FIRE DEPARTMENT**

Fire Service Financial Management

By: Roger C. Sharp
Tulsa Fire Department
Tulsa, Oklahoma

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ABSTRACT

The Tulsa Fire Department (TFD) estimated property fire loss on every fire incident involving loss to property. The problem was that there was not a guide for evaluating property loss. This allowed for inconsistency and inaccuracy in estimating these losses. The purpose of this research was to develop a guide to assist the members in accurately estimating and reporting property fire loss. The study used action methodology as well as historical techniques. The research questions were:

1. What tools or guides are currently available for estimating property fire loss?
2. Do other fire departments in the region have existing property fire loss policies or guidelines?
3. What methods do other fire departments in the region use for estimating property fire loss?
4. How do other fire departments in the region evaluate vacant or condemned property?
5. What are the problems in evaluating property fire loss that are causing problems within the TFD?

The procedures included research performed at the National Fire Academy Learning Resource Center, a search of the Tulsa City/County Library System, a search made of online sources, a survey of regional fire departments, contacts made with local insurance professionals, research of current and past practices of the TFD, and interviews conducted with TFD members.

The results were that the majority of information obtained was in the area of property values associated with construction rather than property loss. Only five of the thirty-one departments returning the survey had formal policies or guidelines for evaluating property fire loss. Of the five with policies only four sent any substantial information that could be useful in developing a guideline for the TFD. Information gained from current TFD Prober Chief computer reports on property fire loss revealed inconsistencies in evaluating property fire loss.

The recommendations included adopting the Tulsa Fire Department Property Fire Loss Guide developed as a result of this study, holding training sessions to introduce the above guide and to identify and reduce problems that lead to inconsistency and inaccuracy in reporting property fire loss. Additionally, it was recommended that all reported property fire loss greater than \$20,000 for residential fires and \$75,000 for fire in commercial facilities be compared to final insurance loss evaluations. The goal is to fall within a 5% to 10% margin of the actual loss and make necessary adjustments for those estimates outside of that margin. The final recommendation made was to begin to study alternatives to reporting property fire loss only in terms of dollars for a designated period of time. The additional alternative should key on measuring the effectiveness of suppression activities from time of arrival until time of departure.

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INTRODUCTION

Every month the Tulsa Fire Department (TFD) Planning Branch produces a report of the incidents that are responded to; part of that report includes an estimate of property fire loss for the city for that particular month. At the end of the fiscal year a report is produced showing the loss figures for the entire year. As with most fire departments, this is used as a measure of effectiveness of fire prevention efforts as well as fire suppression techniques. The problem is that there is no standard for evaluating property loss, which allows inconsistency and inaccuracy in estimating these losses. The purpose of this research was to develop a guide to assist the members in accurately estimating and reporting property fire loss. The study uses action methodology as well as historical techniques. The research questions are:

1. What tools or guides are currently available for estimating property fire loss?
2. Do other fire departments in the region have existing property fire loss policies or guidelines?
3. What methods do other fire departments in the region use for estimating property fire loss?
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5. What are the problems in evaluating property fire loss that are causing inconsistency within the TFD?

BACKGROUND AND SIGNIFICANCE

As with most fire departments across the country, the Tulsa Fire Department (TFD) estimates and reports the property loss caused by fire and uses that information to evaluate the effectiveness of many of its programs. Currently the Incident Commander makes an estimation of the property loss divided into two categories: loss to the structure and loss to the contents. The current procedures allow for variance from one incident commander to the next as to the method and dollar figures used to calculate these losses.

Fire Loss

The total fire loss in Tulsa for all fires for fiscal year 1998 –1999 was \$20,452,665. Of that total, \$17,117,192 was fire loss in structure fires. This was an increase over the previous two-year average of 34% for all fires and 33% for structure fires. This dollar amount increase is in spite of the fact that total fires are down by 6% and the number of structure fires have remained unchanged over that same two-year period. The fiscal year period for the City of Tulsa is from July 1 to June 30 of each year (See Appendix A, p.24).

Tulsa Fire Incident Reporting System (TFIRS)

The TFD uses a reporting system called the Tulsa Fire Incident Reporting System (TFIRS). The Incident Commander is responsible for completing this report upon returning to the station from an incident. The TFD uses a software program for recording these reports called Prober Chief (See Appendix B, p. 28). The report writer has a predetermined list of selections within each category and selects the most suitable choice to reflect the information found at the incident. The important information gathered and

reported for purposes of this discussion are the fixed property use, type of construction, the structure loss, and content loss. Fixed property use would fall into one of the following major divisions:

1. Public Assembly Property
2. Educational Property
3. Institutional Property
4. Residential Property
5. Store - Office Property
6. Basic Industry, Utility, Defense Property
7. Manufacturing Property
8. Storage Property
9. Special Property

After the appropriate division is selected, a subdivision with a TFIRS code is selected from the computer to further define the fixed use. For example: TFIRS code 411 is for a one-family dwelling with year round use, where a 441 code is a Motel with less than 20 units with year round use.

The next important report feature is the Construction Type category. This selection is defined as the type of building construction used in the structure where the fire occurred. This is also used to help analyze what effect the construction type has on fire development, fire spread, and most importantly for this project the resulting damage.

The following are the Construction Type divisions:

1. Fire Resistive
2. Heavy Timber

3. Protected Non-Combustible
4. Unprotected Non-Combustible
5. Protected Ordinary
6. Unprotected Ordinary
7. Protected Wood Frame
8. Unprotected Wood Frame

The final important factor for consideration for this study is an estimate of structure and contents value and determining the estimated loss to both. The entry should be the best estimate dollar loss that is practical to make or obtain. Currently, there is no guideline on how this is to be determined, only that the estimate should be as accurate as possible and should reflect the cost of replacement in like kind and quality.

Fire Service Financial Management Course

This research project is related to the Fire Service Financial Management Course, Module Six, relating to Program Analysis. An analysis of the existing program was performed and deficiencies were identified. Research was then performed and alternatives weighed to come up with a workable solution that would result in more accurate property loss evaluations. This in turn will allow the Tulsa Fire Department to more accurately evaluate the effectiveness of fire prevention programs, fire suppression tactics, current training curriculums and to identify future needs.

LITERATURE REVIEW

According to John P. Hall (1982) estimating the dollar value of property damaged as a result of a fire traditionally has been more of an art than a science. The reason is that there are no generally accepted, step by step procedures that fire officers can use when making damage estimate reports. Officers have a difficult time determining what areas were damaged, how badly, and what it will cost to replace what has been damaged.

The lack of such a procedure undermines consistency in loss estimation from one fire officer to another, and from one fire department to another. Many who use fire loss data for planning or management are understandably nervous about its accuracy; horror stories continue to circulate about observers whose estimates of loss at the same fire differ 10 to 1 or more. (p.11)

Hall further offers four basic tips to help officers make more accurate damage estimates. First, break down the problem into manageable pieces. In small fires, officers should make an estimate based upon a list of exactly what was damaged. Additionally, have at least two independent estimates of the loss at each fire. The old adage of two heads being better than one is applicable here. The second tip was to identify more accurately the type and degree of damage. Rather than estimate an entire room as totally damaged, fire officers should be more detailed as to the actual damage and needed repairs. The third thought was to benchmark costs to provide more objective information for determining loss. This however, will require substantial more effort on the part of fire departments and fire officers. The fourth and final tip is for the establishment of

benchmark indexes. This is one more level of refinement for truly ambitious fire departments to take in estimating fire loss.

Concerns raised by Jerry Harnish (1995) about the lack of consistency in estimating losses are that they weaken the usefulness of information collected. First, it can mask trends in the nation's loss experience and secondly, the potential exists to call into question the databases that use fire department estimates. A third problem associated with inconsistency in reporting is that it makes it difficult to compare communities of similar size and conditions to discover the relative effectiveness of fire protection strategies unless it is known, for certain, that the two communities use the same methods or guidelines for estimating losses. If a reasonable degree of accuracy does not exist in the estimates reported by fire departments, then the usefulness of the information is reduced. Harnish goes on to suggest that a national system be developed to be used as a standard for all fire departments.

He additionally touts the insurance industry as being the most prolific producer of information about estimating losses. There is a need on their part to be exact in estimating to satisfy claims and predict future risks. The insurance industry considers the discipline of estimating as quite sophisticated. What the industry goes through to determine how everything from burned studs to water stains should be factored, is much finer than what is reasonably necessary to provide data for fire service needs. In fact, in his research he found that the methods used by insurance companies for estimating loss are not easily transferred to fire departments for several reasons. The main reason is that the exact information insurers use is proprietary and varies from company to company. A secondary reason is that even though the general procedures may be available in some

instances, the processes they entail require more time and effort than most fire departments could apply to this purpose.

Exact-a-Mate and products by Marshall and Swift Company are what one local claims supervisor revealed that they use in their office. Ron Ryan, (personal communication, August 9, 1999) a Property Claims Supervisor with the Farmers Insurance Company, indicated that they use computer software to assist in making damage estimates. Additionally, claims representatives figure loss as exact as possible. They consider every stud, every sheet of drywall, carpet, light fixture, faucet, etc. that will need to be replaced in order to come up with a dollar settlement for the client. He agreed that this process is probably more extensive than the fire department would want to be involved in. Agents and representatives also go through an extensive training process to be able to make loss estimates. Their training is far more than fire officers receive on the subject of estimating loss. Fire officers are making the estimate for a report, while adjusters are going to write a check to the policy owner.

“For years fire service administrators have been reporting fire losses in such a way that statistics probably are not a true reflection of the performance of the suppression forces” (Silvi, 1986, p. 44). In fact, he claims that fire departments may be selling themselves short in the way they are reporting fire losses. The error is in reporting losses only in terms of dollars, which does not present an accurate comparison of how a department is performing in relation to previous years. He suggests using two alternative methods in addition to the total dollar loss estimates. The first method is called Physical Fire Damage Estimating and the second method Arrival/Departure Loss Estimating. The first method estimates loss in terms of percentages rather than dollar figures. After the

fire is out, the officer estimates the percentage of the building damaged. This allows for comparisons to previous year's loss percentages. Unlike dollar estimates, which can be affected by inflation or skewed by loss in a high value property, this method maintains a consistent measurement from year to year. The second method is a measurement of the loss from the time of arrival of fire companies till the time they depart the scene. It compares the percentage of the building involved upon arrival to the percentage saved by suppression forces.

The R. S. Means Square Foot Cost manual offers a wide range of building types and associated costs for construction (Ferguson, 1997). All costs represent United States national averages and are given in U.S. dollars. The manual is divided into one section for Residential Property and a second for Commercial, Industrial, and Institutional Properties. Residential property is divided into four classes of construction: Economy, Average, Custom, and Luxury. The Commercial, Industrial, and Institutional section has over 70 typical model buildings to choose from. All building costs are expressed in terms of cost per square foot. After a desired property type is identified and located in the manual, an associated picture for that type of property is illustrated to help identify a particular property. Once the property type is selected, then the associated costs can be calculated from the respective charts. The Means Location Factor is then used to adjust that cost to a designated geographical location which makes the cost realistic for individual locations. This manual is a very in-depth and comprehensive application for square foot costing.

Several District Chief Officers were given the above-mentioned manual to peruse and evaluate the possibility of adopting the manual for use in estimating property loss for

the TFD. One member involved in that evaluation was District Chief Greg Neely (personal communication, June 17, 1999). He expressed a concern that indeed the manual was too comprehensive and difficult to use. In his opinion, it would not be conducive for reporting officers to use and as a result they would go back to using current methods of best guess estimate. He further expressed the thought that whatever is developed needs to be user friendly and in a condensed form.

ProEst Professional Estimating Software (1990-1999) is a software program that is used to calculate job costs for construction. It contains forms for contractors to set up and estimate job cost. It starts with the foundation and continues through every aspect of the building process. ProEst can be used by all construction trade professionals from general contractors and landscapers, to electricians and roofers. However, the information and format are definitely geared toward assisting the building industry in bidding construction jobs.

Discussions concerning estimating loss to contents were conducted with Brent Keith (personal communication, July 18, 1999), an insurance agent with Farmers Insurance Company. Descriptions of the different types of residential properties given consideration for inclusion in the proposed guide were discussed with Mr. Keith. Based upon the underwriting of contents for residential property, percentages were recommended for estimating property damage to contents. Contents are estimated at a percentage of the structure for value and also for loss. It was his recommendation that on economy and average types, the contents should be estimated at 50% of the structure. For custom and luxury types, the contents should be estimated at 75% of the structure value. These percentages are consistent with a memo received by the Fire Marshal Allen

LaCroix from District Chief Phil Morgans (See Appendix C. p.30). Chief Morgans had talked with another Farmers Insurance Adjuster who used the Marshall and Swift National Pricing Guide for the cost figures. The property categories are different from the R. S. Means guide, but the range for contents value was from 55% for fair, average and good quality, to 75% for very good and excellent quality homes.

Smoke damage is another consideration in determining loss to a structure. Jerry Burgraph (personal communication, August 10, 1999), of Burgraph Restoration, indicated that they figure smoke damage on an item-by-item basis. Their costs are based upon the actual items damaged by smoke and are not figured on a square foot estimate. When asked if a figure of \$25 per square foot could be established as a fair estimate of smoke damage cost, he said that this would be considered low for contents and structure, but too high for structure only estimates. Three guidelines sent by fire departments responding to the survey dealt with smoke damage. The range was from \$10 per square foot by one department to \$25 per square foot by a second. The other department estimates severe water and smoke damage to portions of the building at 50% of the damage.

It is very apparent that the need for a set of guidelines for fire departments is needed not only in Tulsa, but also around the nation. This is paramount to accurately reporting fire loss, because loss is used to measure effectiveness of programs and efficiency of suppression efforts. Even though the most accurate way to measure loss is in actual and exact calculations performed by the insurance industry, this process is probably not practical for fire department operations. It should not, however, prohibit the establishment of guidelines and procedures drawn from this experienced industry. The

format of the R. S. Means Square Foot Costs seemed to be a good place to begin to develop a guideline for estimating these costs. In place of a very detailed estimate, the guidelines presented in this manual will allow for an accurate square foot cost-estimating tool that can be adjusted to local costs for Tulsa. However, taking into account the need to keep the TFD guidelines simple and easy to use, a user-friendly guide will be the goal. The information gleaned from conversations with insurance industry professionals further influenced the use of percentages for estimating loss to contents. With the factors above in mind, the development of a Tulsa Fire Department Property Fire Loss Guide will be established.

PROCEDURES

Research Methodology

The desired outcome of the research project was to develop a set of guidelines that would assist the members of the TFD in accurately evaluating and reporting property fire loss. The research methodology was action supported by historical methods.

Literature Review

The review of literature was performed through the Tulsa City/County Public Library System and the Learning Resource Center (LRC) at the National Fire Academy (NFA). The search was conducted on the subjects of fire loss estimating and fire loss evaluating. Additionally, a search was conducted by author's names obtained from related NFA applied research projects on file at the LRC. Additionally, a search of Internet sources for property loss estimating and fire loss estimating was conducted.

Personal Communications

Personal interviews were conducted with professionals in the insurance industry. These interviews included an insurance agent and a property claims supervisor. An interview was also conducted with the owner of a fire restoration company for information and costs of his service. Finally, a TFD District Chief was asked his opinion about his findings on one of the cost estimating products reviewed for this project.

Survey Description

A survey was sent to 42 fire departments in the region. Each survey was addressed to the chief of department of the four largest cities in each of the seven states surrounding Oklahoma. The cities to be surveyed were determined by using the *National Directory of Fire Chiefs and Emergency Departments* (1997) and based upon population of the city. Those cities, including those from the state of Oklahoma, were from the states of: Arkansas, Colorado, Kansas, Louisiana, Missouri, New Mexico, and Texas. In addition to the 32 cities above, ten other cities, which are TFD market cities used in comparison for collective bargaining purposes were sent surveys. Those cities are: Austin, Texas; Dallas, Texas; Ft. Worth, Texas; St. Louis, Missouri; Kansas City, Missouri; Wichita, Kansas; Tucson, Arizona; Nashville, Tennessee; Oklahoma City, Oklahoma; and Omaha, Nebraska. If one of the market cities was also one of the largest cities in a state, as in the case of Dallas, Texas, then the next largest city in the state was selected. There were 31 of the 42 surveys returned for a response rate of 74%. View Appendix D, page 33, for a copy of this survey. Along with four of the returned surveys, respondents sent documents from their departments relating to property loss estimating policies and guidelines.

Assumptions and Limitations

Information relating specifically to fire loss-estimating guidelines was somewhat limited. In fact, with the exception of the surveys, most of the information found was based upon construction or remodeling costs and not related to the fire service at all. Attempts were made to find information on the Internet, but most sites were selling software that would perform the task and little was gained from this effort. Attempts to view certain web sites containing damage loss products were denied due to not being an authorized subscriber to the product line. Additionally, only one current applied research project on the subject matter was obtained through the LRC.

The survey was not distributed throughout departments in all of the states, but included only the surrounding states. A broader perspective could have been obtained if more states and departments were surveyed. The sample was not selected at random but contained criteria for the distribution based on the location near Oklahoma and population of the city. The ten market cities were chosen as municipalities closely compared to Tulsa in department size, population, and services provided and are otherwise used primarily for collective bargaining purposes.

RESULTS

What tools or guides are currently available for estimating property fire loss?

The guides found as a result of the research were construction and insurance based. The ProEst software was not useful for this project as it was primarily geared for use in developing construction costs and bidding jobs. Additionally, the Marshall and

Swift products that the insurance industry uses were not readily available in local libraries or on the Internet. The R. S. Means Square Foot Cost book was a very comprehensive book and turned out to be a useful tool in gaining needed information to support this project. Costs were categorized by building types that related well with the TFIRS currently used by the TFD. A conversion percentage called the Means Location Factor adjusted listed costs to local costs for a more accurate appraisal value. Insurance agents and adjusters gave good insight into measuring the loss to contents in structures. The percentages established by the industry that consider the value of contents as a percentage of the structure value were obtained for different residential types.

Do other fire departments in the region have existing property fire loss policies or guidelines?

According to the surveys returned from 31 departments, only 5 out of 31, or 16%, have existing property fire loss policies or guidelines. Of those five departments, four did send their policies along with the returned surveys. They all relied upon an assigned dollar value per square foot to estimate fire loss. Each of the four varied somewhat from the others in its policy or guideline. One department based value per square foot estimations upon occupancy and type of construction, while another department based loss upon the extent of damage to a particular type of construction with an assigned cost per square foot. A third department assigned a dollar estimate per square foot based upon the type of building and also had assigned values for contents. The final department had only three lines contained in their policy. Commercial and residential were estimated at the same value. They also had a value for property located in burned area, and a smoke damage evaluation value.

What methods do other fire departments in the region use for estimating property fire loss?

As mentioned above, only five of the departments returning surveys actually have a formal policy in place for estimating property fire loss. The remaining 26 departments used one of the following methods:

1. Incident Commanders best guess estimate
2. Loss based upon square footage times a dollar figure
3. Value based upon replacement cost
4. Other

The actual results can be seen in question number four of the survey (See Appendix E, p. 35). Contained in the Other category were the following methods: Use of a chart provided by local remodel contractors outlining replacement and remodeling costs, estimates by investigators based upon known dollar loss of similar incidents, contacts made with insurance adjusters after they evaluate the damage and finally, damage based upon the occupants estimation of the loss.

How do other fire departments in the region evaluate vacant or condemned property?

Seventy Four percent (74%) of the departments responding to the survey evaluate vacant or condemned property the same as other property. The remainder of the departments assigns no value to property that is either vacant or condemned. Refer to question number three from the survey included in Appendix E, page 35.

What are the problems in evaluating property fire loss that are causing inconsistency within the TFD?

Two examples were found that illustrate some of the problems the TFD is having in evaluating property fire loss, because of inconsistencies with reporting (See Appendix F, p. 37). First, two reporting officers make different estimates on the same property. The first officer responded to the incident at 0331 hours on June 21, 1998 and rated the value of the structure at \$160,000 and the contents at \$60,000. He estimated the loss to the structure at \$100,000 and loss to the contents at \$20,000. The same day at 1305 hours a second officer, on the oncoming shift responded to a rekindle in the structure and valued the property at \$175,000 for the structure and \$75,000 for the contents. The second officer estimated this structure to be a total loss at \$250,000 where the first officer estimated the loss at \$120,000, a difference of \$130,000. This initially appeared in the fire loss statistics as a total loss of \$370,000 between the two responses. Upon investigation the Planning Branch changed the second report to read no value and no loss and the first report stayed as originally reported. Refer to Appendix G, page 40, under comments and remarks regarding the change.

A second example was one where a fire in a manufacturing facility was originally estimated as a 10 million-dollar loss based upon the reporting officer's evaluation. The officer based his estimation upon information gained from the owner as to the value of several machines within the plant. A follow up by the Planning Branch found the actual loss reported by the insurance company was only 3.5 million dollars, a difference of 6.5 million dollars (See Appendix H, p. 42). Both of these examples illustrate how the loss

statistics can be skewed in a manner as to cause them to be inaccurate and not reflect a true measurement of the property fire loss issue for the TFD.

Conclusion

Two very distinct conclusions can be drawn from the above results. The first is that there is a definite need for a guide for estimating property fire loss to be established for the TFD as well as the fire service as a whole. The establishment of such a guide will better insure consistency and more accuracy in estimating property fire loss for the department. This fact was illustrated very dramatically by the example of two different values being assigned to the same property by two different officers. Although not as exacting as those procedures and methods used by the insurance industry a guide was developed that the author feels will be fairly accurate in estimating cost and simple enough to readily be used by officers of the TFD. The guide is also formatted to flow easily with the current Fixed Property Use categories in the TFIRS. See Appendix I, page 45, for The Tulsa Fire Department Property Loss Estimating Guide developed as a result of the research project.

The second conclusion is that along with instruction about the use of the guide there needs to be further training on the goals of property loss reporting and the need for accurate estimates of loss. This was again illustrated by the example cited in Appendix F, page 37, where the second report rated an additional loss to already damaged property making the total loss for the property greater than its value. The problems illustrated above with the TFIRS need to be addressed so that similar problems can be avoided in the future. When officers are shown the impact on the TFD records that these types of inaccuracies have, it is believed that these same problems will be avoided in the future.

The thought of establishing a method of measurement for fire loss that is more than merely an expression of dollars is very interesting. The fact is that total dollar loss reporting does little to truly evaluate and measuring a department's effectiveness. It also motivates one to look for alternative reporting methods that can be used to measure the effectiveness of activities, programs, and future planning for a department.

DISCUSSION

The purpose of this research is to develop a guide to assist the members in accurately evaluating and reporting property fire loss. The information obtained through the research methods noted in this project indicates the need for a guide for the TFD. Information was used from several of the sources to develop The Tulsa Fire Department Property Fire Loss Estimating Guide as included in Appendix I, page 45.

Much of the research literature supported the need for some type of procedure or standard to insure accurate property loss estimates within the fire service. Harnish (1995) certainly pointed out the lack of consistency in reporting fire loss and how it undermines the whole process of damage reporting. Hall (1982) and Silvi (1986) also recommended the need for some type of consistent reporting system and both gave alternatives and basic guides for strengthening property loss reporting methods. Particularly interesting were Lee Silvi's method of Arrival/Departure Loss Estimating and the use of percentages over dollar amounts. From this, it can readily be seen that any fire department would benefit from having a basic set of guidelines or procedures to better estimate property loss. The responses received to the survey supported the notion that very few

departments use a formal set or standard guide in estimating loss. Again this brings into question several points discussed in the above information. How effective are fire service loss figures? How can comparisons be made from year to year and from one department to another? It makes one ask the questions, why do we do what we do and what do these dollar loss statistics actually mean?

The author's initial thoughts of using the same methods that the insurance industry employ was not supported by the information obtained. The comprehensive approach used by this industry would not easily transfer to the fire service. This was discussed by Hall (1982) and Harnish (1995) as being too complicated, requiring too much training, and not conducive to fire department operations. As Ron Ryan (personal communication, August 9, 1999) pointed out, insurance adjusters estimate the loss so that a check to cover that loss is placed in the policy owner's hand. There is a different motivation for the estimates that fire departments will make.

The problems illustrated within the TFD, which is due to a lack of formal policy and training, certainly brought to light problems that affect reporting accuracy and consistency. However, both problems can be easily addressed through the development of the estimating guide and training of the fire officers of the TFD. In looking at the one example alone, as illustrated in Appendix H, page 42, it demonstrated that if the estimated loss calculation had not been found to be inaccurate and remained unchanged, the total fire loss for that year would have been overstated by 6.5 million dollars. One quickly begins to identify the problems associated with inaccurate reporting.

The R. S. Means Square Foot Costs (Ferguson, 1997) manual was primarily used as the guide for cost determination of different types of structure. This information along

with the memorandum included in Appendix C, page 30, as well as discussions with Brent Keith (personal communication, July 18, 1999), and Ron Ryan (personal communication, August 9, 1999) led to the formulation of the department estimating guide. In fact, the memorandum figures compared to the information in the Means manual gave assurance that the project was on target as far as cost estimates were concerned.

The conversation with Chief Greg Neely (personal communication June 17, 1999) further solidified the author's resolve to make a condensed version of the Means guide and develop a simple, concise, easy to use guide for the TFD.

The article by Lee Silvi, (1986) in which he discussed the arrival/departure loss estimating method, has certainly perked the interest of the author to further pursue this type of estimating alternative. This is included as a recommendation for pursuit in the future. It may even be the topic for a future applied research project by this author.

RECOMMENDATIONS

The first recommendation is to adopt the Tulsa Fire Department Property Fire Loss Guide as developed as a result of this study, as a part of the TFIRS. The second recommendation is to hold training sessions for all members involved in evaluating property fire loss so that the above guide can be introduced and to help identify and reduce problems that lead to inconsistency and inaccuracy in reporting property fire loss. Next, it is recommended that the TFD Planning Branch investigate incidents where the reported property fire loss is greater than \$20,000 for residential fires and \$75,000 for fires in commercial facilities. The branch will then compare the reported loss to final

insurance loss evaluations on the property to verify that the figures were accurate within a 5% to 10% margin. Once comparisons have been analyzed, appropriate adjustments should then be made in the reported loss figures to better insure accurate reporting. The final recommendation made was to begin to study alternatives to reporting property fire loss only in terms of dollars for a designated period of time. The additional alternative should key on measuring the effectiveness of suppression activities from time of arrival until time of departure.

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